

CLAIMS

- 1 1. Method for measuring the binding of analyte molecules to probe molecules, the
2 method comprising the following steps:
3 (a) providing a circuit surface with electronic circuits,
4 (b) providing areas with covalently bound probe molecules, located in spatial
5 proximity to the electronic circuits,
6 (c) binding analyte molecules to the probe molecules and, together with the
7 analyte molecules, electrically conductive nanoparticles, and
8 (d) making the circuits of the circuit surface electrically reading the presence of
9 the nanoparticles and thereby detecting the binding of the analyte molecules.
- 1 2. Method according to Claim 1, wherein the reading by a circuit in step (d) consists
2 of reading the changed stray capacitance near the circuit.
- 1 3. Method according to Claim 1, wherein the reading by a circuit in step (d) consists
2 of reading a voltage on the nanoparticles after contacting the nanoparticles to a
3 contact spot of the circuit.
- 1 4. Method according to Claim 1, wherein the probe molecules are bound to areas of
2 the circuit surface in spatial proximity to the electronic circuits.
- 1 5. Method according to Claim 1, wherein the probe molecules are bound to areas in
2 spatial proximity to the electronic circuits, the areas located on the surface of a
3 countersurface, positioned opposite the circuit surface.
- 1 6. Method according to Claim 1, wherein the probe molecules are covalently bound
2 to the surface and, in step (c), the analyte molecules are affinity bound to the
3 probe molecules.

- 1 7. Method according to Claim 1, wherein the nanoparticles are already bound to the
2 analyte molecules.
- 1 8. Method according to Claim 1, wherein in a first part of step (c), analyte molecules
2 are bound to surface-bound probe molecules and in a second part of step (c),
3 nanoparticles with adhesion molecules fixed to them are attached to the bound
4 analyte molecules.
- 1 9. Method according to Claim 3, wherein the nanoparticles are pressed against a
2 contact spot of the circuit by a movement of the countersurface, and wherein a
3 voltage applied to the countersurface can be measured via the nanoparticles in
4 the circuits of the circuit surface.
- 1 10. Method according to Claim 3, wherein a galvanic element is created by the metal
2 surface of the bound nanoparticles, by a metal counterelectrode spot of limited
3 size on the circuit and by a suitable electrolyte, which, by contact of the
4 nanoparticles with contact spots separated from the counterelectrode spots,
5 generates an electric current in the circuit surface from the contact spots towards
6 the counterelectrode spots, enabling the binding of analyte molecules to be
7 measured.
- 1 11. Method according to Claim 10, wherein the contact between nanoparticles and
2 contact spot is made by electrically conductive molecules.
- 1 12. Method according to Claim 11, wherein the electrically conductive molecules are
2 compounds of the polyene class.
- 1 13. Method according to Claim 9, wherein the contact is made by the nanoparticles
2 touching the contact spot.

- 1 14. Method according to Claim 13, wherein analyte molecules and nanoparticles are
2 bound to probe molecules located on an insulating surface opposite the circuit
3 surface, and the contact of the nanoparticles with the contact spots is made by
4 pressing the insulating surface with the bound nanoparticles onto the contact
5 spots of the circuit surface.
- 1 15. Method according to Claim 13, wherein analyte molecules and magnetizable
2 nanoparticles are bound to probe molecules located on a surface opposite the
3 circuit surface; the linkages between nanoparticles and analyte molecules or the
4 linkages between the analyte molecules and the probe molecules are broken;
5 and the contact of the now no longer immobilized nanoparticles with the contact
6 spots of the circuit surface is made by an external magnetic field acting on the
7 nanoparticles.
- 1 16. Method according to Claim 13, wherein analyte molecules and magnetizable
2 nanoparticles are bound to probe molecules located on the contact spots of the
3 circuit surface, and the contact of the nanoparticles with the contact spots is
4 made by the effect of an external magnetic field or by mechanical pressure of a
5 countersurface on the nanoparticles.
- 1 17. Method according to Claim 13, wherein the circuit surface or the surface of the
2 nanoparticles is loaded with electrically conductive protrusions.
- 1 18. Method according to Claim 1, wherein DNA oligomers are used as probe
2 molecules, the analyte molecules are amplified in a previous step by polymerase
3 chain reactions (PCR) using a biotinylated primer, and the nanoparticles are
4 bound to the biotin groups of the analyte molecules by being coated with
5 streptavidin.
- 1 19. Method according to Claim 18, wherein instead of the biotin-streptavidin binding
2 pair another binding pair is used.